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LIQUID DISPOSABLE PLASTIC CONTAINER

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LIQUID DISPOSABLE PLASTIC CONTAINER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefit of U.S. Provisional Patent Application No. 60/427,721, entitled "LIQUID DISPOSABLE PLASTIC CONTAINER," filed November 20, 2002, the entire disclosure of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] The invention relates to containers in general, and more specifically, to plastic containers that can be filled with liquid medication.

BACKGROUND

[0003] There are two forms of drug delivery devices for inhalation medication, metered dose inhalers (MDI's) and nebulizers. Nebulization is the most effective delivery technique for respiratory medication. A nebulizer is a small, hand-held unit that connects to a forced air source and turns the medication into a fine mist that is inhaled. The medication to be nebulized is provided in a unit dose vial designed for a single use, or unit of use. For administration, the patient dispenses a unit dose into the nebulizer cup, or bowl. Often patients require a medication that is not commercially available and these medications are prepared by compounding pharmacies. After the pharmacist prepares the medication, individual doses are placed into single, unit dose plastic vials,

which are then crimped and sealed by a thermal impulse heat sealer. Relatively long sealing times, however, are necessary with conventional vials to achieve a satisfactory crimp and seal of the open end of the vial. In addition, the crimping and sealing processes cause residual stresses in the structure of the vials. The stresses may result in a weakness in or around the seal or the seams of the vial, which may ultimately cause the vial to leak. A vial that minimizes residual stresses while at the same time substantially reducing the sealing cycle time is needed.

[0004] Plastic vials that feature break-away caps, or tips, which are integrated into the vial, are known to those of ordinary skill in the art. To administer a nebulization treatment, the patient, or care-giver, twists the break-away tip and squeezes the medication into the nebulizer bowl. However, often the process of removing the break-away tip distorts the dispensing opening resulting in a smaller dispensing opening than was designed for the vial, and sometimes, a completely blocked opening. Therefore, a vial that has a dispensing opening that minimizes the effects of removing the break away tip is needed.

SUMMARY

[0005] The present disclosure provides a plastic vial having a fill port with a structure that is easily collapsible and that minimizes the residual stresses in the vial after it has been filled with medicine and sealed. According to one embodiment, the structure of the fill port includes a circular end that is proximal to the body of the vial, and an elliptical end that is distal to the body of the vial. According to another embodiment, the structure of the fill port includes a proximal end, with respect to the body of the vial, and a distal end, also with respect to the body of the vial. The proximal end is selected from the group consisting of a diamond-shaped end, an elliptical end and a circular end. The distal end is selected from the group consisting a diamond-shaped end and an elliptical end. A vial according to the present embodiments can be sealed in less time as compared to the time to seal conventional vials. Additionally, other embodiments have dispensing openings that minimize the effects of distorting the dispensing end when the break-away tips are removed.

[0006] These and other features, and advantages, will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings. It is important to note the drawings are not intended to represent the only form of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Fig. 1 is a top view incorporating one embodiment of the present disclosure.

[0008] Fig. 2 is an end view of the embodiment of Fig. 1.

[0009] Fig. 3 is a detail view of one aspect of the embodiment of Fig. 1.

[0010] Fig. 4 is an end view of the embodiment illustrated in Fig. 1.

[0011] Fig. 5 is a side view of the embodiment of Fig. 1.

[0012] Fig. 6 is a top view of a series of vials incorporating aspects of the present invention.

[0013] Fig. 7 is an end view of the series of Fig. 6.

[0014] Fig. 8A is an end view of another embodiment of the present disclosure.

[0015] Fig. 8B is a side view of the embodiment of Fig. 8A.

[0016] Fig. 9A is an end view of another embodiment of the present disclosure.

[0017] Fig. 9B is a side view of the embodiment of Fig. 9A.

[0018] Fig. 10A is an end view of another embodiment of the present disclosure.

[0019] Fig. 10B is a side view of the embodiment of Fig. 10A.

DETAILED DESCRIPTION

[0020] The present disclosure provides a unique system for containing and delivering pre-measured products, such as liquids, drugs, medication, cosmetics, or other forms of unit of use products. It is understood, however, that the following disclosure provides many different embodiments, or examples, for implementing different features of the invention. Specific examples of materials and arrangements are described below to simplify the present disclosure. These are, of course, merely examples and are not intended to limit the invention from that described in the claims. Well-known elements are presented without detailed description in order not to obscure the present disclosure in unnecessary detail. For the most part, details unnecessary to obtain a complete understanding of the present disclosure have been omitted inasmuch as such details are within the skills of persons of ordinary skill in the relevant art.

[0021] Turning now to Fig. 1, there is illustrated a vial 10 according to one aspect of the present embodiments. The vial 10 can be made out of any suitable material, such as a basic thermoplastic material, such as polycarbonate, polyethylene, polyester, polystyrene, polypropylene, polysulfone, polyurethane, ethylene-vinyl-acetate and the like. The material may be transparent or translucent and may be of different colors.

[0022] The vial 10 has two ends, a dispensing end 12 and a filling end 14. At the filling end 14 there is an opening or hollow fill port 16. The structure of the fill port 16 includes an exterior elliptical end 18 and an interior circular end 20. The exterior elliptical end 18 is distal to the main body 22, while the interior circular end 20 is proximal to the main body 22. The circular end 20 is joined to the main body 22 of the vial 10. The main body 22 forms a cavity 23 for holding the product. The elliptical end 18 of the fill port 16 provides an external opening for use in filling the main body 22 with a product. As illustrated, the circular end 20 flares out in a generally lateral direction to create the elliptical end 18.

[0023] Fig. 2 is a end view of the vial 10. As illustrated in this embodiment, the fill port is structured to include an elliptical end 18 that tapers down to the circular cross-

sectional shape of the circular end 20. The elliptical end 18 and the circular end 20 provide the fill port 16 with a structure that reduces the residual stresses within the vial 10 when the elliptical end 18 is sealed. Because the residual stresses are reduced, the seal is stronger and is less likely to fail. In addition, the structure of the fill port 16 is easily collapsible, which enables a reduced sealing cycle time as compared to sealing cycle times of conventional vials.

[0024] Turning back to Fig. 1, it can be seen that the main body 22 tapers down to a hollow neck 24. The hollow neck 24 may be used by the end user when dispensing product from the main body 22. The neck portion 24 couples to a break-away tip 26.

[0025] Fig. 3 is a detail view of one embodiment of the break-away tip 26. In this embodiment, the neck 24 is coupled to a round bulb 28. The round bulb 28 contains a cavity 30 that is in hydraulic communication with the cavity 23 of the main body 22 via the hollow neck 24. The round bulb 28 is surrounded by a relatively flat portion 32. The flat portion 32 may have a reinforced edge 34 around its perimeter.

[0026] Fig. 4 is an end view of the break-away tip 26, showing the flat portion 32 and the round bulb 28.

[0027] Turning back to Fig. 3, the end user may use the flat portion 32 to twist the tip 26 which will shear at the weakest cross section or "shear edge". In this embodiment, the weakest cross-section is a shear edge 36, which is adjacent to the bulb 28. The shear edge 36 may be serrated to further reduce the cross-sectional area so that the cap 26 will shear along the shear edge 36. In other embodiments, two round bulbs could be used which would create a shear edge between them. The use of the round bulbs or shear edge reduces the distortion that could occur when the break-away tip 26 is twisted off. Distortion is undesirable because distortion could clog or reduce the product passage in the neck 24.

[0028] Turning now to Fig. 5, there is a side view of the vial 10. The side view shows the fill port 16. From this view, it is evident that in the transverse plane the fill port 16 may taper down from the circular end 20 to the elliptical end 18. Fig. 5 also shows the main body 22 tapering down to the neck 24. The neck 24 is coupled to the bulb 34 of the break-away tip 26.

[0029] The vial 10 may be produced either by blow –molding procedures or by injection molding procedures. Additionally, the vial 10 may be produced as a series of vials 40 as shown in Fig. 6. Each vial 40a-40e may be joined along common edges 42a through 42d, respectively. Fig. 7 shows an end view of the series of vials 40a through 40e.

[0030] Although the structure of the fill port 16 is illustrated in Fig.1 to include an elliptical end 18 that tapers down to the circular cross-sectional shape of a circular end 20, other embodiments of the present disclosure provide alternative geometrical shapes or combinations of shapes that are easily collapsible and that reduce or eliminate residual stresses within a vial being sealed. Referring now to Figs. 8A – 10B, other embodiments of the present disclosure are illustrated.

[0031] In Fig. 8A, an alternative structure for a hollow fill port according to the present disclosure is illustrated. The structure of the hollow fill port includes an exterior elliptical end 78 and an interior elliptical end 80. As illustrated in Fig. 8B, the interior elliptical end 80 is proximal to and joined to the main body 82 of a vial. The exterior elliptical end 78 is distal to the main body 82. The main body 82 forms a cavity for holding the product, while the exterior elliptical end 78 provides an external opening that is used to fill the main body 82 with a product. As illustrated in Figs. 8A and 8B, the interior elliptical end 80 is substantially the same size as the exterior elliptical end 78. That is, the exterior elliptical end 78 does not taper down to the interior elliptical end 80. The interior elliptical end 80 and the exterior elliptical end 78 provide the fill port with a structure that is easily collapsible, which enables a reduced sealing cycle time as compared to sealing cycle times of conventional vials. The structure of the hollow fill port as illustrated by Figs. 8A – 8B also reduces the residual stresses that occur in the vial during sealing, which in turn results in a stronger seal that is less likely to fail.

[0032] In Fig. 9A, another structure for a hollow fill port according to the present disclosure is illustrated. The structure of the hollow fill port includes an exterior diamond-shaped end 88 and an interior circular end 90. As illustrated in Fig. 9B, the interior circular end 90 is proximal to and joined to the main body 92 of a vial. The exterior diamond-shaped end 88 is distal to the main body 92. The main body 92 forms a cavity for holding the product, while the exterior diamond-shaped end 88 provides an

external opening that is used to fill the main body 92 with a product. As illustrated in Figs. 9A and 9B, the exterior diamond-shaped end 88 tapers down to the circular cross-sectional shape of the circular end 90. The circular end 90 generally flares out, and the flared portions are shaped, to create the diamond-shaped end 88. The exterior diamond-shaped end 88 and the circular end 90 provide the fill port with a structure that reduces the residual stresses within the vial when the exterior diamond-shaped end 88 is sealed. Because the residual stresses are reduced, the seal is stronger and is less likely to fail. In addition, the interior circular end 90 and the exterior diamond-shaped end 88 provide the fill port with a structure that is easily collapsible, which enables a reduced sealing cycle time as compared to sealing cycle times of conventional vials.

[0033] In Fig. 10A, yet another structure for a fill port according to the present disclosure is illustrated. The structure of the fill port includes an exterior diamond-shaped end 98 and an interior diamond-shaped end 100. As illustrated in Fig. 10B, the interior diamond-shaped end 100 is proximal to and joined to the main body 102 of a vial. The exterior diamond-shaped end 98 is distal to the main body 102. The main body 102 forms a cavity for holding the product, while the exterior diamond-shaped end 98 provides an external opening that is used to fill the main body 102 with a product. As illustrated in Figs. 10A and 10B, the interior diamond-shaped end 100 is substantially the same size as the exterior diamond-shaped end 98. That is, the exterior diamond-shaped end 98 does not taper down to the interior diamond-shaped end 100. The interior diamond-shaped end 100 and the exterior diamond-shaped end 98 provide the fill port with a structure that is easily collapsible, which enables a reduced sealing cycle time as compared to sealing cycle times of conventional vials. The structure of the hollow fill port as illustrated in Figs. 10A – 10B also reduces the residual stresses that occur in the vial during sealing, which in turn results in a stronger seal that is less likely to fail.

[0034] Any combination of the elliptical, circular and diamond-shaped geometries of the embodiments illustrated by Figures 1 – 10B herein are suitable to provide a structure that is easily collapsible and that reduces the residual stresses that occur in the vial during sealing. For example, a diamond-shaped proximal end can be combined with an elliptical distal end. Other geometries not illustrated herein are also

suitable. Using the teachings and suggestions of the present disclosure, those of ordinary skill in the art could design such alternative geometries or combinations of geometries that are easily collapsible and that reduce or eliminate residual stresses within a vial being sealed. Such alternatives are within the scope of the present disclosure.

OPERATION

[0035] Further operations of the present disclosure will now be explained with reference to the embodiment illustrated in Fig. 1. The embodiments illustrated in Figs. 8A – 10B are also suitable for use in such further operations, as are other embodiments not illustrated herein, but within the means of those of ordinary skill in the art to design, using the teachings and suggestions of the present disclosure.

[0036] Once the vials have been supplied to the packager, such as a compound pharmacy, the vials may be filled with a product by filling the fill port 16 until the cavity 23 contains the desired amount of product. The fill port 16 may then be sealed in a conventional manner, such as a thermal impulse heat sealer or ultra-sonic sealer.

[0037] If the vial is to be used in conjunction with a nebulizer, an end user, such as a patient or care-giver would twist the break-away tip 26 and squeeze the product into the nebulizer bowl. The patient would inhale the fine mist created by the nebulizer.

[0038] Although only a few exemplary embodiments of this invention have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments. Accordingly, all such modifications are intended to be included in the scope of this invention as defined in the following claims.